CLAIMS

What is claimed is:

1. A method for calculating the instantaneous reactor split of a polymerization reaction, the method comprising the steps of:

producing under separate reaction conditions at least two polymeric compositions, each composition comprising at least two different polymers, each polymer having at least one different monomer or reactant incorporation;

determining for each polymeric composition: the incorporation of at least one monomer or reactant, a corresponding reactor production rate and reactor split; and

determining a linear equation defined by the reactor splits and corresponding ratios of (monomer or reactant incorporation/ production rate).

2. The method of claim 1 wherein the reactor split is determined by a chromatographic method.

3. The method of claim 3 wherein the chromatographic method is size exclusion chromatography.

4. A method of controlling reactor split in a multimodal polymerization reaction, comprising the steps of:

applying a predetermined linear relationship to control a polymerization reaction,

polymerizing at least one monomer in the presence of at least two catalysts;

obtaining periodic incorporation and production rate data from the reaction; and

adjusting periodically at least one reaction variable to maintain a desired reactor split according to the predetermined linear relationship.

5. The method of claim 4 wherein the reaction variable is a ratio of the catalyst that produces a first resin to the catalyst that produces a second resin.

6. The method of claim 4 wherein the reaction variable is the ratio of the catalyst feed rate that produces a first resin to the catalyst feed rate that produces a second resin.

7. The method of claim 4 further comprising the step of controlling at least one reactant concentration to maintain a desired reactor split.

8. The method of claim 7 wherein the reactant is hydrogen.

9. The method of claim 4 wherein a first catalyst is a metallocene catalyst and a second catalyst is a Zeigler-Natta catalyst.

10. The method of claim 4 wherein a first catalyst is a metallocene catalyst and a second catalyst is a bisamide catalyst.

11. The method of claim 4 wherein the incorporation is controlled by the relative addition rates of at least two monomers to the reactor.

12. The method of claim 4 wherein one monomer is an alpha-olefin monomer having at least two carbon atoms.

13. The method of claim 4 wherein one monomer is selected from the group consisting of ethylene, propylene, butene, hexene, octene or mixtures thereof.

14. The method of claim 11 wherein one monomer is butene or hexene and a second monomer is ethylene.

15. A method of producing a polymer composition by controlling the reactor split of a multimodal polymerization, comprising the steps of:

determining a desired reactor split for a multimodal polymer composition based on at least one physical property of the composition;

polymerizing at least one monomer in the presence of at least two catalysts under conditions that yield a composition having the desired reactor split; and

periodically adjusting at least one reaction variable according to a predetermined linear relationship to maintain the desired reactor split.

16. The method of claim 15 wherein the composition is a film grade bimodal high density polyethylene and at least one monomer is ethylene and the at least two catalysts are co-supported Zeigler-Natta and metallocene dry catalysts.

17. The method of claim 15 wherein the composition is bimodal high density pipe grade polyethylene and at least one monomer is ethylene and the at least two catalysts are spray-dried bisamide catalyst and a metallocene catalyst.

18. The method of claim 15 wherein the at least one monomer is selected from the group consisting of ethylene, propylene, butene, hexene, octene or mixtures thereof.

19. The method of claim 15 wherein one monomer is hexene and a second monomer is ethylene and the catalysts are selected from the group consisting of bisamide, metallocene, Zeigler-Natta, or mixtures thereof.